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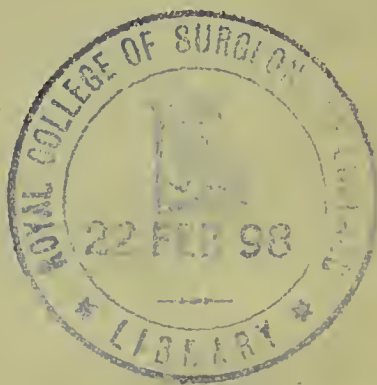
PLAGUE

BY

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INTRODUCTION.

AN attempt has been made in the following pages to offer to the public a short treatise on plague, embodying the latest investigations on the subject. It is hoped that, while it may be useful to the medical practitioner, it may also be read with advantage by the educated citizen in whose hands lies so much of the prevention of this dire disease.

Plague is, indeed, one of the greatest misfortunes that can befall mankind. It would probably never occur if the people could only be brought to recognise that plague, and indeed all epidemics, are preventible, and if they would only submit to the necessary preventive measures. There is, unfortunately, so much ignorance on all subjects appertaining to health that any disturbance of old habits is only too apt to rouse the conservatism into active hostility against sanitary measures. Ignorance is at the bottom of all mischief. Supernatural causes are often assigned for epidemics, and such beliefs have great influence on the lives and actions of people. Wherever plague has appeared, people ignorant of its causes have given way to terror, misery and despair.

If this pamphlet helps people in realizing that stringent sanitary measures are absolutely necessary to prevent and stamp out this disease, and if it arouses public interest in sanitary topics and removes some ignorance and superstition, I shall be amply gratified.

I have drawn my information from almost every available source. Our knowledge of plague is much greater now than it was after the Hongkong epidemic. Dr. Yersin's serum has been extensively tried, Mons. Haffkine has given us a prophylactic serum, and Mr. Hankin's investigations on the plague bacillus have greatly increased our knowledge about its vitality.

B. L. D.

LAHORE, *1st February*, 1898.

P.S.—An Urdu translation of this pamphlet is in course of publication.

Definition.—Plague originally meant any fatal epidemic. Now, however, it has a special significance. That terrible disease which has played a havoc on the happiness and prosperity of mankind through many centuries, and has yet got Bombay in its grip, has by universal testimony acquired the name of “the plague” among all plagues and pestilences. It is called *Mahamari* in Kumaon. Bubonic plague is a good name, as it conveys the idea of a fatal epidemic disease characterised by enlarged glands. Dr. Cantlie has given it the name of “malignant polyadenitis.” Plague may be defined as a specific, infectious disease characterised by fever, inflammation of the lymphatic glands, and by marked nervous disturbance. “Plague” is a well-recognised name.

HISTORY.

Plague is a very ancient disease. It is impossible to trace back its origin, but this much is certain that it was known long before Christ. It is probable that, at least, some of the terrible epidemics recorded in ancient books were those of plague. It is believed by some authorities to have been known in China, India, Egypt and Greece during the early ages. It was recently pointed out by an exponent of Sanskrit medicine that plague was known in Ancient India, and described in the Vedic books under the name of “Vidradhi.” On careful study I have found that there is very little resemblance between the two.

The epidemic in Athens, B.C. 430, is considered by many authorities to have been that of plague. The majority of the plague epidemics that occurred in the South-eastern Europe could be traced to Egypt, where the disease was endemic for a long time. Among the accounts of the early plague visitation, perhaps the most interesting is that of A. D. 542 given by Gibbon. It began in Egypt, and soon invaded the

sea-coast of Europe. Constantinople and many other towns, both in Turkey and Italy, suffered severely. The deaths in Constantinople were estimated at from 5,000 to 10,000 a day.

It is believed that Ireland was frequently attacked by plague in the early days, although it would not be easy to trace its origin in Egypt. But the first definite record is in 762. It is stated that eighteen epidemics occurred in England before the great epidemic of 1665. The "black death" of 1349 was surely an epidemic of bubonic plague. It began in China, and reached Europe through Central Asia and Levant. In 1665 occurred the great plague of London. Like most of the bad epidemics, it came from Egypt. It was first brought to Amsterdam by a ship from Algiers, and it soon attacked Hamburg and surrounding parts. A few cases occurred at Westminster towards the end of 1664. They were removed to the City of London, where the disease broke out suddenly. The next three or four months were very cold, and thus the disease was kept in check. In the Spring, 1665, it increased tremendously. It was at its height in September, and in November it gradually declined. It is estimated that about 100,000 people perished of this disease in London.

In 1720 plague was brought to Marseilles by a ship from Syria, and killed 40,000 out of a population of 90,000. In 1751 it destroyed 150,000 in Constantinople. In 1760 it attacked Cyprus, Egypt and Syria. In 1771 it was brought to Moscow by soldiers engaged in fighting with Turkey. In 1799 Morocco was affected, followed by the invasion of the surrounding parts. Again, in 1834 about 15,000 people died of plague in Alexandria. After this there were small outbreaks in Egypt, Arabia and Persia. Plague is believed to be endemic in Tripoli, Mesopotamia and Persia. In Southern China it has been present for a long time. In 1894 it occurred in Canton,

where it carried away 60,000 persons. It then spread to Hongkong and Amoy. This outbreak lasted about two years.

The first epidemic of plague known in India was in the reign of Jehangir, the Moghal Emperor. Mr. Rodgers tells us in the current number of the *Indian Magazine and Review* that it is recorded in the autobiography of the Emperor himself. There is no record of plague after this until 1815, when there was an outbreak on the island of Kutch, afterwards spreading to Guzerat and Sindh. In 1828-29 it occurred at Hansi, in 1836 round about Bareilly and at Pali, and finally attacked Jodhpur and the neighbouring parts, disappearing in 1838. In 1876 there was an outbreak in Kumaon and Garhwal, where it is believed to have been endemic ever since.

About the Bombay epidemic, many people believe that the disease first made its appearance in July 1896. But it was not until the 11th September, 1896, when Dr. Viegas, a private practitioner, made a statement to that effect, that public attention was directed towards it. It was then found that the death-rate in Bombay had steadily increased in the previous months, and there was nothing to account for it, except the presence of plague. How the disease originated in Bombay, is not quite settled. The disease first made its appearance in a quarter of the town called Mandavi, which is close to the docks and a most densely populated portion of the City. Some believe that the disease was brought there from Hongkong; others say that it was brought from Kumaon, where the disease is endemic. Either of them may be true, but no proof is yet available to show the exact origin of infection.

After getting a thorough hold on Bombay, the disease attacked Poona (8th October), then Kurrachi City (10th December), Kutch, (January 1st, 1897), Hyderabad, Sindh, 12th

January), Sukkar (12th February), and Rohri (23rd February.) A few cases occurred at Hardwar during July, and then at Kankhal during October. Our province has been fortunate so far, except a few cases that have occurred in the Jullundur and Hushiarpore districts. There was a great fear of plague breaking out at the Thanesar fair, where some lakhs of persons collected on the Sun-eclipse day ; but, thanks to the efforts of the Sanitary Commissioner and other authorities, the disease has not been imported. We should, however, be quite prepared to meet it and kill it, if perchance its germs force their entrance into our towns.

CAUSES.

Before dealing with the modern view of the causation of plague, I think it may be useful to say a word about the supernatural causes to which this disease was ascribed in the olden days. Some explained it by the wrath of God, or of the gods ; and some by the Astrological phenomena. Comets were often looked upon with dread and horror, and supposed to have some connection with plague. In the Fourteenth Century, the College of Physicians of Paris ascribed it to the influence of the constellations in India. As the gradual evolution of thought proceeded, more rational causes were put forth. Putrefaction of dead animals, poisonous exhalations from the mud of the Nile, excessive heat, excessive rain, watery grain, &c., were thought to generate plague. Incongruous theories are not generally entertained in Europe now-a-days. One does come across faddist and superstitious people even in England, like the anti-vaccinationists, and like the "peculiar people" who disbelieve in doctors, and treat their sick by "laying hands" on them ; but such people are comparatively few. In India, however, superstition yet reigns supreme.

Let us now pass on to the modern view, which is that plague is due to a specific bacillus. For the benefit of my lay-

readers, it may be necessary to say a few words about micro-organisms generally. The micro-organisms are minute living bodies, invisible to the naked eye, and seen only by the highest powers of the microscope. They exist almost universally in the air we breathe, the water we drink, the food we eat, the soil we dwell on. They are found in the mouth and nose, on our bodies, under our nails, &c. In fact, wherever animals or vegetables lie and die, there are micro-organisms present. They are absent from the atmosphere on the heights of glaciers. There are different kinds of microbes. All of them are not injurious and destructive. There is a very useful class of microbes, by means of which the brewer converts sugar into alcohol, and the baker makes his bread. Without the aid of microbes, there would be no beer, no wine, no vinegar, no bread, &c. But we must pass on to the evil-producing microbes those capable of producing disease. They are called "pathogenic micro-organisms." These are our foes, and, in order to break and destroy their power, we must know their habits and their modes of attack. They may exist without disease in nose, mouth, &c., but they are never present in the juices of tissues of the normal body. They invade the humane body by wounds and abrasions of the skin and superficial mucous membranes, and through mouth, nose, &c., and, finding suitable soil, cause specific diseases. The germs can never arise *de novo*. There used to be a theory that the germs could arise of themselves under certain atmospheric and telluric conditions, but we need pay no attention to this obsolete theory. Just as a crop of wheat can not be expected to arise spontaneously, and without the seed having first been sown, so cannot a specific disease originate without its specific germ being there. Life must come out of life, and plague must come out of plague.

Plague is caused by a specific micro-organism which grows and multiplies under favourable conditions. If the soil is not

fit, the germs may be sown, but they will not germinate; and, if the soil is fit but the germs are absent, the disease will not occur. The soil best suited for the plague germ is one where insanitary conditions prevail. The soil is prepared for the plague harvest by poverty and misery, dirt and filth, overcrowding, bad air, bad water, &c. The history of plague illustrates this point clearly. The plague of London was called "the poor's plague," and in Bombay the disease commenced in the poorest quarter of the town.

The plague bacillus.—The plague bacillus was discovered simultaneously and independently by Kitasato, a Japanese bacteriologist, and Yersin, a French bacteriologist. We may call it Kitasato-Yersin bacillus. It fulfills the three canons of Koch as to the specific cause of a disease, *viz.*, it is found in all plague cases and in no other disease; it can be cultivated outside the animal organism; and, when introduced into other organisms, it produces the same disease, proved by the same bacillus being found in them. The plague bacilli are found in the discharge from buboes, and in affected glands themselves. Their presence in the excreta is denied by Mr. Hankin. They are found in the spleen, and in many cases also in blood, lungs, and other organs. The bacteriologists in Bombay did not always find them in blood, but only in the worst cases. The bacilli are also found in the upper layers of the soil in the affected places. They are short rods with rounded ends, with a clear space or band in the centre; readily stained, except in the centre, by aniline dyes; and without any power of movement. They are about one-sixth the diameter of a red blood-corpuscle in length, and about half the length in breadth. They can be readily killed in three or four hours by direct sunlight, by moist heat 65° C. for 40 minutes, by weak antiseptics, and by weak acids. On woollen material they die after four or five days, on linen in three days. They can be cultivated on ordinary agar-agar rendered just alkaline.

Man, mice, rats, guineapigs, rabbits, are very susceptible to plague.

Predisposing Causes.—(1) SOIL AND CLIMATE.—The nature of the soil and the elevation of the ground have no influence on the occurrence of plague. It may occur in a place with a dry soil or a damp soil, or one which is frozen and covered with snow. It may occur in valleys as well as on hilly districts. The new world is the only part in the globe where plague has not occurred. The climate and season have some influence on the onset of plague. A moderate temperature, as between 60 and 85° F. is favourable to it, whereas a very high or low temperature is found unfavourable to it. But there have been exceptions; it prevailed during the severest cold of winter on the Volga and in Moscow, and in extreme heat in Smyrna and Kumaon. It is said that a warm moist atmosphere is favourable to it. In South China and in Bombay it commenced at the end of a very dry season; and in Hongkong the rains increased it.

(2) SEX AND AGE.—In Bombay more males died of plague than females, but in other epidemics the case was reverse. In Bombay people, between the ages of 20 and 30, suffered most frequently, but in other epidemics those between 10 and 20 suffered most. It seems, on the whole, that sex and age have little influence on the occurrence of plague.

(3) SOCIAL POSITION.—Poverty is an important predisposing cause, although in Bombay many well-to-do people died of it.

(4) HYGIENE AND INDIVIDUAL PREDISPOSITION.—Hygiene has a great influence on the occurrence of plague. Dirt and filth, overcrowding and bad ventilation, effluvia, bad drains, want of cleanliness generally, &c., are great factors in the growth

and spread of plague. The poor people are generally the first victims, because of their living in miserable houses, and of bad or insufficient food. Any disease producing a debilitated condition of the body, overwork of any kind, bad and irregular food, fear of plague, &c., are predisposing causes.

INFECTION.

It is generally held that the plague bacillus enters the humane body by three principal channels: by breath, through an external wound, and by the intestinal tract. Dust from the infected floor, and direct inoculation may give rise to plague; but there is no evidence to show that the disease is ever contracted through food. Grain may be infected by diseased rats, but cooking makes it sufficiently safe for food.

Plague is a very slow disease. It takes some weeks or months to travel from one town to another. During the first three or four weeks isolated cases occur in one locality, and afterwards the disease increases suddenly. The concensus of opinion seems to be that plague is both contagious and infectious. When a case of plague occurs in a house, the other inmates of the house are almost certain to be seized. Servants, nurses and doctors, who are brought in contact with the patient, are very liable to acquire the disease; but this point is not agreed upon.

There are some authorities who do not believe in the contagious nature of plague. They point to the fact that in the Egypt Epidemic of 1835, out of ten French doctors who attended the sick, only one contracted the disease; and, further, one doctor (Bulard) wore the shirt of a patient who died of plague for 2 days, and yet he did not contract the disease. Again, in the Hongkong epidemic of 1894, none of the European doctors and nurses and Chinese medical students died of plague.

But all this can be easily explained. The doctors and students only visited the patients; they did not stay with them for any length of time. They performed their duties in a well-ventilated hospital, and thus the chance of contracting the disease was reduced to a minimum. The shirt which Bulard wore did not generate any poison, and the poison already contained therein grew every moment more dilute. That nurses are more liable to be affected than doctors, was sadly proved both in the Hongkong epidemic of 1896 and in Bombay by some deaths. Intimate and prolonged contact with the contagium in an active condition is almost sure to cause infection. On the other hand, free ventilation and attention to hygienic rules lessen the chance of contracting the disease to a very great extent. All are liable to contract the disease when exposure is extreme.

It is generally believed that plague is a miasmatic or soil-bred disease like malaria. Its germs find a suitable nidus in earth, in water (?), or in some particular form of fermenting or decomposing material. In a neighbourhood so infected, the disease is endemic; it recurs now and again. In support of this miasmatic theory, it is pointed out that rats are invariably affected. These rats may infect other animals, such as jackals and snakes, who consume them; and they are to some extent responsible for the spread of plague among human beings. How they infect man, is not decided. The disease among rats is generally found to be a forerunner of its outbreak in man. Such was the case in Bombay.

It should be remembered that the plague bacillus is found in the discharge from buboes, sometimes in the fæces and urine, and in the case of pneumonic plague in the sputum also. Infected linen, bedding and furniture may also spread

the infection. Persons living on the ground floor are more liable to be infected than those living on the upper floors.

Filth and overcrowding are chiefly responsible for the occurrence of plague : it is a disease of filth. It is in the dirty quarters of a town that plague is most virulent. In hospitals it seems to lose its contagiousness ; those attending on the sick in hospitals are very rarely infected.

In the spread of plague from one town to another, or from one district to another, man himself is chiefly responsible. An infected person travels to a fresh town or village, where a new focus of infection is formed.

CLINICAL FEATURES.

The clinical features of plague vary considerably in different epidemics and even in individual cases of the same epidemic. The typical course of the disease is something like the following :—

Incubation.—The period of incubation, *i.e.*, the period of time intervening between infection and development of the symptoms, is generally $2\frac{1}{2}$ to 6 days, but may be up to nine days.

Symptoms.—The onset is generally quite sudden. The patient suddenly feels a sensation of cold, and perhaps vomits. His temperature rises, and he at once takes to bed. Frontal headache is generally present. About this time enlargement of the lymphatic glands with tenderness is noticed in the groin, axilla or neck. This may occur with the initial feeling of shivering, or it may be delayed for many hours. The patient has a tired, weary look, as if he has had no sleep for two or three nights. His skin is hot and dry. Tongue is furred, and there is great thirst. Pulse is increased in frequency,

but varies greatly in fulness. Respirations are greatly increased. The enlarged glands are like movable, round lumps, and are very tender.

The patient soon becomes worse. He becomes weak, listless and drowsy. He shows restlessness, moving about his arms and legs every now and then. He tries to sleep, but he cannot. The enlarged glands become surrounded with inflammation and œdema, which may extend down the thigh. He may then pass into a state of muttering delirium, or coma with typhoid state ; or he may remain intelligent to the last.

Death may occur from exhaustion, or from sudden collapse at any stage of the disease. If the patient survives till the fourth or fifth day, there is a chance of his recovery. After one week the symptoms gradually abate, but suppuration of the glands may delay convalescence, or even cause death by septicæmia.

The above is the general description, but the symptoms vary greatly. It will be necessary to consider the prominent symptoms in detail.

FEVER.—The temperature usually rises early in the disease, and may be 103° to 105° F. on the first day. Patient first feels a sensation of chilliness and even shivering, then he feels hot. Temperature keeps high for three or four days, when it generally falls. If it keeps up for five days, the case is a severe one. If the temperature comes down suddenly, and other symptoms do not abate, the patient may die.

BUBOES OR ENLARGED GLANDS.—These occur in 90 per cent. of cases. They are most frequently situated in the groin, next in the axilla, and in a few cases in the cervical region. Deep glands are affected rarely. The enlarged gland feels like a rounded, movable lump, from a pea to an

almond in size. It is painful, and tender on pressure. It increases in size, and surrounded by inflammation. There may be only one gland enlarged, or a chain of glands, or glands in several situations. The swelling increases in size and involves the surrounding tissues. The skin over the gland may become purplish in colour, and may slough. The gland may suppurate, or it may gradually disappear. Healing is always very slow. Bacilli are found in the pus. Parotid gland often becomes inflamed, and may suppurate.

NERVOUS SYMPTOMS.—These are the results of the toxins secreted by the bacilli, while the bacilli themselves affect the glands. There is severe frontal headache, and often lumbar pain. There is great restlessness and sleeplessness, although he seems drowsy. His mind is slow to act, and he is disinclined to talk. There is generally partial deafness. He may pass into low muttering delirium, or into active delirium when he may have to be tied down to bed. He may then pass into coma. The pupils are dilated, and conjunctivæ insensitive. Respiration is hurried, and pulse quick and feeble. The facial expression is at first anxious, then weary and listless, and finally apathetic as in typhoid.

TONGUE.—At first it is covered with a thin white fur, the papillæ showing as pink dots; and then with a thick dry layer of brownish tinge which comes off in flakes in the later stages. The under-surface of the tongue has a bluish tinge. Towards the end, the tongue becomes dark brown, dry and shrivelled. There is loss of appetite and great thirst.

SKIN.—It is hot and dry, but the hands and wrist may be normally cool. Petechiæ are rare.

URINE.—It is diminished in quantity, very acid, and decomposes soon. Chlorides are greatly diminished.

Varieties of plague.—(1) Mild plague or *Pestis minor*; (2) Severe plague or *Pestis major*; (3) Pneumonic plague, which killed Dr. Manser and the nurse who attended him. There is the usual fever, but instead of enlarged glands there is cough with expectoration. The sputum is thin and watery and contains the bacilli. It is very fatal, the patient dying in from two to four days; (4) Plague without buboes. This is not very common, and is rather difficult in diagnosis.

Complications and Sequelæ.—(1) Conjunctivitis and ulceration of the cornea; (2) Congestion of the lungs, which may go on to pneumonia; (3) Septicæmia; (4) Abscesses are very common; (5) Diarrhœa; (6) Hemorrhages of all sorts. The chief sequelæ are anæmia, dysentery, insanity and paralysis.

Diagnosis.—The sudden onset, high fever, painful enlargement of the glands, and restlessness, render the diagnosis easy. Pulmonary plague is difficult of diagnosis, except by bacteriological examination of the sputum. Malaria, enteric and remittent fever may be mistaken, if enlarged glands are not looked for, or if the glands are not enlarged. It is possible that an individual suffering from enlargement of glands due to syphilis, scrofula, or injury, and having some fever, may be mistaken for a plague case. Careful examination will invariably settle the diagnosis.

Prognosis.—The mortality is about 90 per cent. when the epidemic is at its height. Stout persons bear the disease much worse than thin persons. Pregnant women frequently die. If the temperature keeps high and nervous symptoms are prominent, the case is serious. Complications like septicæmia must be carefully watched, as they are always serious.

PATHOLOGY.

The affected glands contain hemorrhages in their substance, and are surrounded by blood. The tissues around are

deeply congested, and on their outside is a pale and œdematous layer of tissue. The glands are very soft, and have a tendency to break down into pus. The deeper glands are much less frequently affected than the superficial glands. Bacilli are found in the gland substance.

All the internal organs are congested and enlarged. Petechiæ are present on serous membranes. Bacilli are found in the internal organs, especially in spleen. Hemorrhages are very common in the mucous membrane of the stomach, and of the intestines especially at the cœcum.

In the Hongkong epidemic, bacilli were found in abundance in blood, and in urine and fœces. But in Bombay the bacteriologists have found the bacilli in blood only in the worst cases, and none at all in the urine and fœces.

TREATMENT.

Although we have no specific cure for plague at present, experience shows that medical aid is just as necessary in this as in any other disease. Although we cannot alter the severity of the disease, we can certainly give the patient the best chance of surviving it. It has been proved again and again that the mortality of the plague hospitals is much less than the general mortality of plague in the same town. The general line of treatment is as follows :—

1. Absolute *rest* in bed in the recumbent position. The patient should have even his food lying down.

2. At the outset it is generally necessary to give a *pur-gative*, such as five or six grains of calomel. A saline aperient may be followed, if necessary.

3. *Food*.—Milk, milk and sago, milk and rice, soup, &c., are best. Forcible feeding may be necessary in some cases. During convalescence, meat and bread can be given.

4. *Alcoholic Stimulants* are always needed, as there is great depression and tendency to collapse. Brandy and rum are best.

5. *Medicines.*—*Cardiac Tonics and Stimulants*, such as Strychnine, Digitalis, Ammonium Carb, are generally given. Liquor hydrarg perchlor, in doses of two to four drachms, has been advocated by Dr. Thompson as a specific; but other practitioners have not found it particularly useful.

6. To bring down the *Temperature*, tepid sponging and ice to the head are very useful. Antipyrine and other depressing medicines should be avoided. Quinine may be given in small doses.

7. For *Sleeplessness*, chloral and bromide of potassium, or opium, may be given.

8. In the treatment of the *Glands* there is a great diversity of opinion. Some consider an early incision the best treatment, others believe in removing the whole mass of affected glands. Some apply poultices to bring on suppuration, others use belladonna and glycerine to get absorption. When suppuration has set in, the pus should, of course, be let out at once. If the glands are very tense and there is great pain, a free incision is the best thing.

9. *Dr. Yersin's Anti-Plague serum*, which is obtained by the inoculation of horses with plague bacilli at frequent intervals until the animal shows no reaction to further inoculations, is considered to be both preventive and curative. It has been extensively tried in Bombay, but without much success. It is quite possible that the serum used was not of sufficient strength to have the desired effects, so we may hope to see better results with strong serum. The inoculation is done in the subcutaneous tissue of the flanks, with

antiseptic precautions. About 20 to 30 C. C. are injected. Cough and kidney disease contra-indicate the inoculation.

10. *Mons. Haffkine's prophylactic serum*.—This is obtained by cultivating the plague bacilli in sterilised bouillon in flasks, to which a little ghee (clarified butter) is added. 80° F. is the best temperature for this purpose. Several fresh growths are allowed to take place, until the bouillon is full of bacilli. Temperature is then raised to 158° F. (70°C.) for an hour to kill all germs. It is this fluid containing the dead germs and the products of their metabolism which is used for the inoculations. It is packed in test-tubes which are then sealed up. They should be kept in a dark and cool place.

The tube before being opened is shaken, and its contents well mixed up. For an adult man the dose is 3 to 3½ C. C.; for a woman 2 to 2½ C. C.; for a child of 10 about 1 C. C. The serum is injected under the skin of the flank or arm. After two to four days, the operation is repeated with a similar dose. It is needless to say that all antiseptic precautions should be taken. The inoculation is followed by slight fever, pain and tenderness at the seat of inoculation, and sometimes vomiting. The symptoms, however, soon pass off. About 12,000 persons have been inoculated with this serum. A few cases got plague after inoculation, but almost all of them recovered. We must, however, wait for further reports.

SANITARY MEASURES AGAINST PLAGUE.

These are of two kinds :—(1) Preventive Measures.

(2) Measures necessary for eradicating the disease after it has got a foothold in a certain district.

Preventive measures.—(1) The sanitary condition of the province or district in view should be improved, so that the plague germs, even if imported, may not find suitable condition for their growth. Strict cleanliness should be observed in every way. Filth should be removed, and overcrowding prevented. Personal hygiene should be attended to, and disinfectants should be used freely. (2) The importation of plague germs should be prevented. We must make observation camps on all lines of communications, and inspect the travelling public—(a) **OBSERVATION CAMPS.**—Our object is to prevent any infected person to pass. A suspected person should be detained for nine days (the longest period of incubation) from the time he left the infected area. This will be sufficient to determine whether he is infected or not. There should be sheds for examinations of persons, sheds for disinfection of clothes, sheds for their living and so on. (b) **RAILWAY EXAMINATION.**—Suitable stations have to be fixed where both local and through trains can be inspected. Passengers are detrained, and sometimes detained for a few hours for a carbolic bath and sterilization of their clothes. There are many difficulties in railway inspection. When Sukkar was fixed as an inspection station, it was found that people booked to stations short of Sukkar, and rebooked to stations on the other side. In the examination of a person, his expression, temperature and glands will settle the question. (c) If there is a chance of plague being carried to any town or locality, compulsory notification of deaths and house-to-house visitation may be necessary.

MEASURES FOR ERADICATING AN EPIDEMIC.

On the occurrence of a plague case in a certain locality, a Plague Committee under the provisions of Epidemic Diseases Act of 1897 should at once be formed. Their orders are to be carried out by the Municipality without delay. The Com-

mittee may consist of a Deputy Commissioner, a Medical Officer, an Engineer, and a Police or a Military Officer. The town should be divided into districts, each district or division having a Medical Officer of its own, with the requisite staff and other requirements. Search parties should be sent out to report plague cases. The infected person should be taken to the segregation camp, and the infected house closed and marked with a circle in red paint.

The disinfection of such a house is carried on in the following manner:—On entering the house the disinfecting party open all doors and windows. Clothes, &c., are carefully taken outside. They should possess large quantities of perchloride of mercury lotion—(1 in 1,000 to which hydrochloric acid in the proportion of 2 in 1,000 is added). This is sprayed with hand pumps in every part of the house. All furniture is then wiped over with a cloth soaked in this solution, and then dried in the sun. The walls, floors and ceilings are whitewashed with a hot and strong solution of quicklime to which a little chloride of lime has been added. Mr. Hankin suggests that infected dwellings should be washed with the Mercury lotion, and on the following day with dilute Sulphuric acid (1 in 250). He recommends dilute Sulphuric acid for washing out passages, court-yards, and surface drains. If the floor is of mud, it should be dug up for four inches after sprinkling Mercury lotion. It may be necessary to remove a portion of the roof to improve ventilation. The house is then locked up, and permission for occupation may be granted after two to four weeks.

In every case where houses are to be evacuated provision should previously be made for those who have to leave their houses. *Chhapar* huts can be made easily. They are

placed in rows, and are usually $15' \times 15'$ or $10' \times 12'$. Two kinds of camps are made, besides the observation camps. (1) Health Camps, where people from one infected area are placed, to prevent them from being infected. (2) Segregation camps, where families who have had plague among them live. These are often placed near the plague hospitals.

Plague hospitals should be light and airy. Some disinfectant should be thrown on the floor daily. A tub of mercury lotion should be put for the hands of nurses, &c. Every patient on admission should get a carbolic bath, and new clothes. All his clothes should be burnt or disinfected. All bed pans and vessels for discharges should contain Mercury lotion, and all discharges should be burnt or deeply buried. All corpses should be shrouded in a sheet soaked in carbolic lotion, and should be disposed of immediately.

